

Automatic Energy Meter Reading System Using GSM Technology

Prof. S.R.Kurkute¹, Gopal Girase², Prashant Patil³

Department of Electronics & Telecommunication, SIEM, Nasik, India^{1, 2, 3}

Abstract: Automatic Energy Meter Reading system (AEMR) regularly read the energy meter and calculate total amount of bill at the set dead line and sends the message to service provider. From energy meter received data i.e. user name, meter ID, total units with paying amount this message maintained at database server which located at service provider department. By using this system save the time required for conventional billing system and minimized human work load. User and service provider both are get correct reading and bill amount. AEMR System can provide message at hourly, daily and monthly by the request. This technology reduced the man power, reading collection time, theft of electricity also avoids late bill payment. By apply this system data security improve. And improve customer and service provider services. Due to this system service provider quickly find out illegal and late bill paying customer by accessing database. So GSM based AEMR system is more efficient that conventional billing system.

Keywords: Digital Energy meter, GSM module, RTC, Microcontroller, PC, etc.

I. INTRODUCTION

Now a day energy meter reader goes to every premise and takes the reading manually then issues the bill. In manually reading human error possible and not provide reliable meter reading. An energy meter is a device which is used to measures the consumption of energy of any residence or other industrial establishment. In Conventional metering system to measure electricity consumption the energy provider company hire persons who visit each house and record the meter reading manually. This is only a sluggish and laborious. In Conventionally metering system people try to manipulate meter reading by adopting various corrupt practices such as current reversal or partial earth fault condition, bypass meter, magnetic interference etc. If any consumer did not pay the bill, the electricity worker needs to go to their houses to disconnect the power supply.[1]The wide proliferation of wireless communication propose and explore new possibilities for the next generation Automatic Meter Reading (AMR) whose goal is to help collect the meter measurement automatically and possibly send commands to the meters. Automation ranges from Connecting to a meter through an RS-232 interface for transmitting the meter measurements all the way from the meter to the utility company via GSM network. [2]

We are use the digital energy meter in implies a times-sampled system. An analog to digital converter sampled current and voltage transducers output at a high frequency, translating real world waveforms to binary words that digital circuitry can understand and manipulate. Digital energy meters maintain their accuracy over a larger current range than the mechanical meter. These new meters are also stable over change in temperature, voltage and line frequency.

II. LITERATURE STUDY

O. Homa Kesav, B. Abdul Rahim are the ideas under the titled of “Automated wireless meter reading system for monitoring and controlling power consumption. The ARM7 LPC2148” microcontroller module takes the data

from the energy meter and performs the necessary control operations like breaking the circuit through Relay control unit and the required information to the mobile phone via the communication module GSM. The MAX-232 which was inbuilt in the ARM7 is used as a serial communication interface for the GSM modem for transmitting the data from the controller to the mobile phone. In the Load bank section a 60W incandescent bulb is used as a load for the purpose of energy consumption of the user.[3]

Shraddha Male Pallavi Vethekar, Kavita More, Prof. V. K. Bhusari are “Smart Wireless Electronic Energy Meter Reading Using Embedded Technology” In this paper he concluded that The metering IC creates the output in the form of pulses which are counted using the default timer of PIC microcontroller unit. These pulses are identified by the transition of high and low voltage of the automatic voltage regulator. A TTL inverter circuit is used to reverse the produced pulse before applying to the counter. For reading the data from the metering IC, microcontroller is programmed using software interfacing. When microcontroller reads the energy usage, this data is stored and updated in software. In this, meter is measured for 1 unit of energy consumption and it creates 3200 pulses in LED [4]

S. Arun, Dr. Sidappa Naidu. Are the under the titled “Design and Implementation of Automatic Meter Reading System Using GSM, ZIGBEE through GPRS”. This paper presents an implementation methodology for a wireless automatic meter reading system (WAMRS) incorporating the widely used GSM and Zigbee network. In many countries GSM and GPRS network is widely known for its vast coverage area, cost effectiveness and also for its competitive ever growing market. Using GSM as the medium for WAMRS provides a cost-effective, wireless, always-connected, two-way data link between utility company and WAMRS, the WAMRS sends information of utility usage, power quality and outage alarm to utility company, tampering detection to the utility servers. In this paper we suggest a method where we utilize

telecommunication systems for automated transmission of data to facilitate bill generation at the server end and also to the customer via SMS, Email. [2]

E. Moni Silviya, K. Meena Vinodhini, Salai Thillai Thilagam. J. is the gives idea under the titled “GSM Based Automatic Energy Meter System with Instant Billing”. System which measure the current consumption unit through IR sensor unit. The IR transmitter is placed in the rotating unit of the EB meter. The receiver photo diode is placed in a certain place which is used to find no of rotation. By getting the number of rotation we get the current consumption. These system may be applied in Industrial control, medical system and access control.[5]

Ashna. k, Sudhish N. George are the give ideas under titled “GSM Based Automatic Energy Meter Reading System with Instant Billing” In this system the two wire power supply is connected to the energy metering IC through the analog front end of the MCP3905 energy meter evaluation board which provides average active power information via a pulse output which may be then used to be processed by a Micro Controller Unit (MCU). The GSM unit is interfaced to the micro controller via a MAX 232. User GSM modem transmits usage details to office modem. Every house/premise has a unique number (consumer number), which is given by the corresponding authority. [6]

V. Rajesh Parvathala, T Venkateswara reddy, N V G Prasad gives the ideas under titled “ARM Based Wireless Energy Meter Reading System along with power on/off circuit” Basically system has 3 sections, Meter section, control unit section & mobile unit. Control unit is a consisting of ARM 7 processor LPC2148, zigbee module, GSM module and 3 switches (STATUS switch, ON switch, OFF switch) Meter unit is a consisting of ARM 7 processor LPC2148, zigbee module, energy meter, relay.

The entire operation of the system will do from control unit by proper selection of the switches. When switch 1 is selected then the system reads the energy meter reading in terms of number of units wirelessly through zigbee modules & then electrical bill is measured for corresponding number of units consumed by the energy meter & sends the information regarding the electrical bill will be sent to consumer mobile through GSM module message consisting of information regarding electrical bill & the deadline for the payment of the bill. When the consumer fails to pay the electrical bill in time then the power supply to energy meter will disconnect wirelessly by proper selection of switch& then the status of the energy meter sent to the consumer.[7]

P. Rakesh Malhotra, Dr. R. Seethalakshmi are Automatic Meter Reading and Theft Control System by Using GSM In this paper he concluded that GSM technology used to transmit the meter reading to the customer and government with the required cost. This process will happen for 60 days once transmission between customer and government. Then the energy theft controlled by IR sensor, magnetic reed switch and some other technique with high security. [8]

III. SYSTEM IMPLEMENTATION

Need of automatic GSM based energy meter system: some problems faced by government as well as ordinary peoples for take reading to each and every energy meter of homes and paying the bill. Some of the problems which need to be overcome are stated in following table.

| | |
|---|---|
| 1 | MSCB department rule ismeter reading is more than 100 units then amount of per unit will be a change. |
| 2 | Illegal Usage. |
| 3 | Efforts of manual data collection. |
| 4 | Units count and bill amount error and maintance cost |

Some of the important issues are given in the table. This can be solve by automatic GSM based energy meter system. Automatic energy reading system can be implemented with the help of different types of processor as we discuss it in our review paper under title Automatic energy meter reading system using GSM tech. System from that study we conclude that system can be more efficient if it is implemented by using AVR controller. Hence in this paper we are going to implement the AEMR (automatic energy meter reading) using AVR controller.

The block diagram of GSM Based automatic energy meter reading system Using AVR Microcontroller is shown in the Fig.1 and fig.2 this system consists of various parts such GSM module, Optocoupler, RTC, Energy meter, UART cable, computer system.

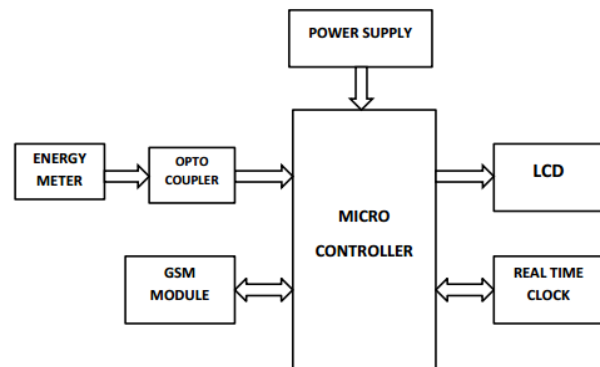


Fig.1 block diagram of GSM based energy meter (transmitter block)

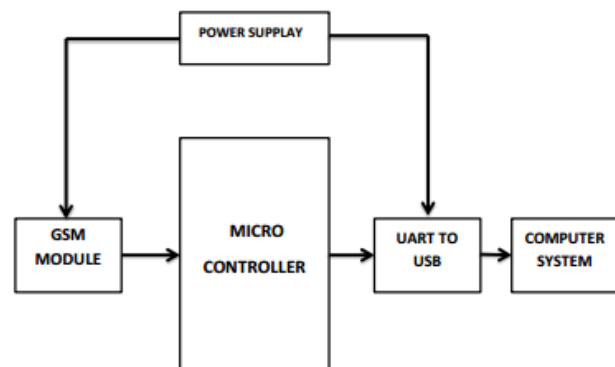


Fig.2 block diagram of GSM based energy meter (receiver block)

Microcontroller continuously monitors and records the energy meter reading in its permanent (non-volatile) memory location. This system also makes use of a GSM modem for remote monitoring and control of Energy Meter. The Microcontroller based system continuously records the readings and the live. Meter reading can be sent to the Electricity department on request. A dedicated GSM modem with SIM card is required for each energy meter.

Microcontroller AVR-AT mega 16: ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. The output of power supply is given to the Vcc pin of the microcontroller. ATmega16 has an inbuilt 10 bit, 8-channel ADC system.[9]

Digital meter implementation: The meter is constructed using off the shelf components such as evaluation board (MCP3905A), a Microcontroller and LCD (16*2). The evaluation board is used to calculate the power by sensing the load that is connected to it. The AVR microcontroller is used to accumulate the consumed energy by saving the readings in the microcontroller memory. The LCD will display the reading.[10]

GSM modem: Quad-band intelligent GSM/GPRS modem suitable for long duration data transmission. To implement AMR system a GSM modem is connected to a microcontroller which would transmits data from a meter to cell phone and also receives command from cell phone to energy meter. The modem will send unit or pulses (power consumption) on a regular interval or on a request. AT commands set which stands for attention terminal are used by energy meter to communicate with the GSM Modem.[11]

PC (Visual Basic): Visual Basic is a tool that allows you to develop Windows (Graphic User Interface - GUI) applications. The applications have a familiar appearance to the user. Visual Basic is event-driven, meaning code remains idle until called upon to respond to some event (button pressing, menu selection, Visual Basic is governed by an event processor. Nothing happens until an event is detected. Once an event is detected, the code corresponding to that event (event procedure) is executed. Program control is then returned to the event processor.

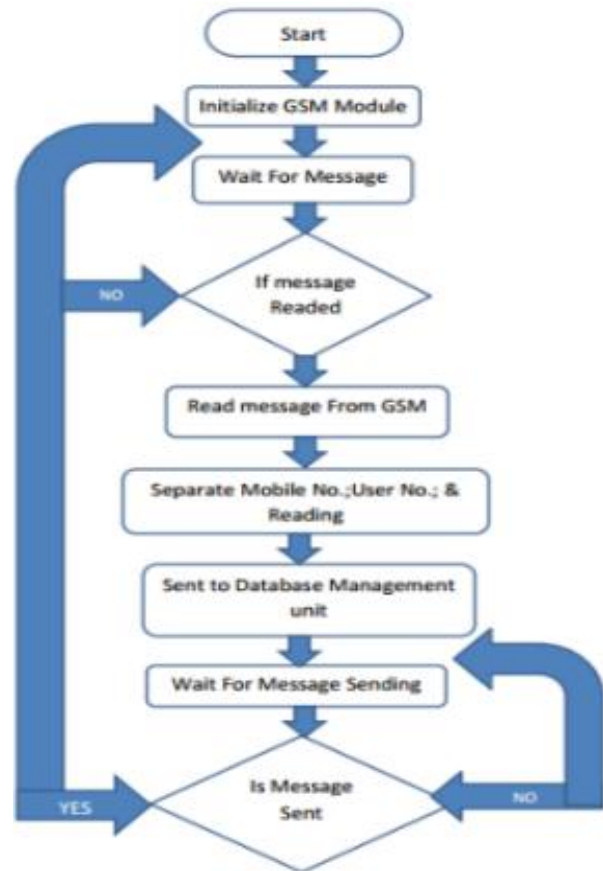
Some Features of Visual Basic:

- Full set of objects - you 'draw' the application
- Lots of icons and pictures for your use
- Response to mouse and keyboard actions
- Clipboard and printer access
- Sequential and random access file support
- Useful debugger and error-handling facilities
- Powerful database access tools

Software requirement

- Proteus ISIS 7.0
- Protel 99se
- PICKit 2 v2.61.

FLOWCHART



Flow chart of Energy Meter Using GSM

ADVANTAGES

- System helps to maintain the data properly.
- This system is very accurate, simple and low power consumption.
- Which is used for the real time applications.
- Provider side is easy to manipulate for bill generation and other such task.

APPLICATION

- Electricity departments.
- Industrial Energy remote monitoring.
- Household Energy meter monitoring.
- Railway electrical systems.

IV. EXPECTED RESULT

Existing Meter Reading Systems:

Meter Reading and Billing are among the most time consuming functions performed by municipalities and energy distribution companies. It should be clear that such methods are very time consuming and does not satisfy the consumer and service provider, in addition to the large number of errors incorporated in the reading process.

Automatic meter reading system:

So AMER system necessary because speed, accuracy, and cost effectiveness are the strongest features in this system. The results from the system is the system should have a display which shows the following information on screen when dead line is come which set in programming

Such types of message automatically send to service provider when dead line comes.

V. CONCLUSION

In the present work wireless meter reading system is designed to continuously monitor the meter reading and it avoids the human intervention, provides efficient meter reading, avoid the billing error and reduce the maintenance cost. It displays the corresponding information on LCD for user notification. and mainly it maintain the database of meter reading which received by the consumer energy meter.

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BIOGRAPHY

Prof. Swapnil R. Kurkute -Received BE in Electronics and Communication Engineering and ME in Communication from North Maharashtra University, Jalgaon-Maharashtra. Presently working as a Assistant

Professor in department of Electronics and Telecommunication Engineering of sandip foundation's SIEM, Nasik.

Mr. Gopal Girase –PursuingBE in Electronics and Telecommunication engineering from department of Electronics and Communication Engineering of sandip foundation's SIEM, Nasik.

Mr. Patil Prashant–Pursuing BE in Electronics and Telecommunication engineering from department of Electronics and Communication Engineering of sandip foundation's SIEM, Nasik.